En face swept-source optical coherence tomography in wet age-related macular degeneration.

The hallmark of wet age-related macular degeneration (AMD) is choroidal neovascularization (CNV) that can be mainly classified following either angiographic or tomographic findings. According to fluorescent angiography (FA), CNV can be classified as occult, minimally classic (class 1, 20% of total lesion size) or predominantly classic (class 2, 50% of total lesion size). According to optical coherence tomography (OCT), CNV can be classified as type 1 (below the retinal pigment epithelium or RPE), type 2 (above the RPE) and type 3 (intraretinal or subretinal). CNV appearing hyporeflective in FA images is believed to be mostly type 2. However, it’s important to take into account that FA imaging can underestimate lesions with significant axial anatomical distortion of the retinal layers, such as RPE detachments, large subretinal or intraretinal fluid, which is often the case in deeper layers of the eye. supposition that offers a promising alternative to angiography to study neovascular AMD. There seems to be a correlation between FA findings and en face SS-OCT images in these patients.

Hyperreflective changes are predominant at the level of choriotaplasia, Sattler’s layer and Haller’s layers. These preclinical images have been validated in larger clinical studies.

Due to the higher imaging speed, more scans can be averaged in a shorter time frame resulting in higher quality scans. The higher speed capturing images and the uniform image quality over depth appears to allow for better resolution in the study of some choriotaplastic diseases.

En face SS-OCT mode provides a coronal view of the choroid and retina of the posterior segment at different depths. It supplies additional information to conventional cross-sectional imaging, allowing the physician to make rapid diagnosis across the macula, in a non-invasive manner.

The SS-OCT device employed by us was DRI-1 Atlantis OCT (Topcon Corporation, Tokyo, Japan) which generates an OCT image containing 512 x 256 axial scans with a scan length of 12 x 9 mm was employed. This sampling space in object space corresponds to 11.7 μm/pixel. Lateral resolution was set to be 20 μm with 24 mm axial eye length while axial resolution was 8 μm in retina. Lateral and axial resolution is independent. Acquisition time was 1 second. Horizontal and vertical line scans containing 1,024 axial scans with 12 mm length were also performed.

En face, or C-scan, images were obtained with a prototype software provided by Topcon (Topcon Corporation, Tokyo, Japan) which generates the images after an automatic flattening at RPE level, using the three-dimensional volumetric scan (SD), which produces an OCT image containing 512 x 256 axial scans with a scan length of 12 x 9 mm. This segmentation allows a better quality of the images due to the correction of the concavity of the eye, correction of tilted tomography, correction of anatomic distortions due to retinal edema and/or subretinal fluid. The software also allows an image averaging up to 25 times to increase the image quality.

En face images were obtained at different planes: 1) most superficially at the RPE level, 2) just below the RPE to image the choriotaplasia, 3) at Sattler’s layer or medium-diameter vessels layer level, 4) at Haller’s layer or large-diameter vessels layer, 5) at the choroid-sclera junction.

We compared the CNV in en face SS-OCT with other imaging modalities, such as FA and indocyanine green angiography (ICGA). The lesions in the en face SS-OCT and FA images were measured with the calliper provided by the devices.

We studied 83 eyes with the recent diagnosis of wet AMD, 22 eyes being classified as type 1 CNV, 5 eyes as type 2, 7 eyes as mixed type 1 and 2, and 4 eyes as type 3 or RAP lesions (Figures 1 and 2).

En face images at RPE level revealed changes in all eyes with the CNV appearing hyperreflective in 76.3% of the cases. At the choriotaplasia level, en face images showed pathological changes in all cases as well, being hyperreflective in 52.6% of the eyes. Likewise, at Sattler’s layer, 52.6% of the eyes showed hyperreflective lesions.

In conclusion, en face SS-OCT is a technology that offers a promising alternative to angiography to study neovascular AMD. There seems to be a correlation between FA findings and en face SS-OCT images in these patients.

REFERENCES